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Karyological and dispersal biological notes on *Galium ankaratrense* Puff *(Rubiaceae)*

M. Kiehn & C. Puff

Summary : The Madagascan endemic *Galium ankaratrense* is tetraploid (n = 18, 2n = 36). Its chromosome base number is unusual (x = 9; vs. x = 11, the dominant base number in *Galium* and *Rubiaceae* in general). The species exhibits geocarpy, a most uncommon situation in the genus. The affinity of *G. ankaratrense* to the East African alpine species *G. hochstetteri* is briefly discussed.

Résumé : *Galium ankaratrense*, espèce endémique de Madagascar, est tétraploïde (n = 18, 2n = 36). Son nombre chromosomique de base est remarquable (x = 9; vs. x = 11, nombre de base dominant chez *Galium* et les *Rubiaceae* en général). L'espèce est géocarpique, ce qui est très exceptionnel dans ce genre. Les affinités entre *G. ankaratrense* et *G. hochstetteri*, espèce alpine de l'Afrique orientale, sont brièvement discutées.

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INTRODUCTION

A botanical collecting expedition to Madagascar in 1985 (C. P.) provided the opportunity to study in the field and to obtain preserved material and chromosome fixations of *Galium ankaratrense* Puff, a species only known from the highest part of the Ankaratra mountains (Puff & Mantell, 1982).

KARYOLOGY

Feulgen preparations for the study of both mitoses and meioses were made from flower buds of *G. ankaratrense* (Madagascar, Ankaratra, slopes below Tsiafajavona, *Puff et al. 850826-2/1*, WU); methods follow Kiehn (1985).

The chromosome number is n = 18 and 2n = 36 respectively (Fig. 1). Thus the tetraploidy of the species, postulated by Puff & Mantell (1982) on account of the relatively large average pollen diameters, is confirmed. Meioses take place in buds less than 1 mm long; no meiotic disturbances were observed. The meiotic chromosomes are very small, measuring only about 0.5 μm (metaphase I).

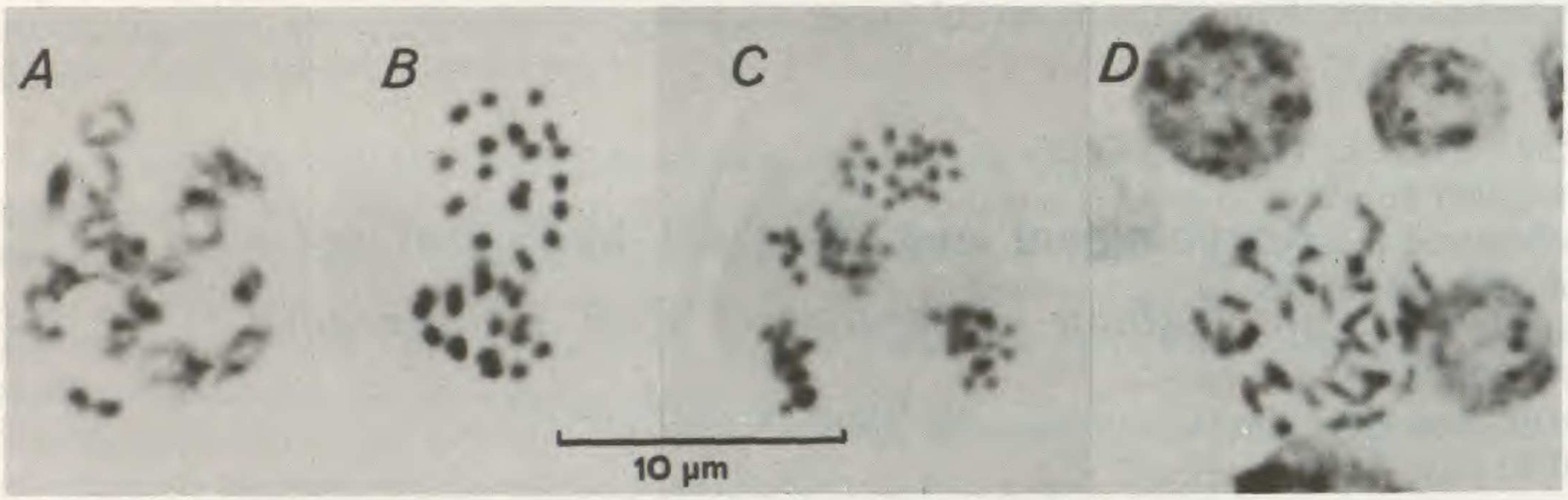

Fig. 1. — Chromosomes of **Galium ankaratrense** : **A-C**, n = 18, meiosis pollen-mother-cells; A, prophase; B, metaphase I; C, metaphase II; **D**, 2n = 36, mitosis (prometaphase) young flower bud tissue; dark stained nuclei in interphase.

DISPERSAL BIOLOGY

The species always forms dense mats or cushions which are mostly found in relatively moist, sheltered places such as the base of rocks or around large clumps of grasses or sedges. Analyses of such mats or clumps show that they are formed by entangled shoots of numerous plants, representing different age generations. This growth form comes about in the following manner : Apparently after fertilization, the pedicels of the developing fruits start to elongate; by the time the fruits are mature they are up to ca. 40 mm long and have thickened considerably (Fig. 2; pedicels of flowers are ca. 1 mm long!). The elongating pedicels push the developing fruits into the loose ground below, so that the mature fruits are entirely underground. The fruits/mericarps will start germinating in the following growth period from below the original (perennial) "mother" plants, giving rise to an even denser mat or cushion, now consisting of the branched shoots of the mother plant and the "new" plants. In a number of years, such mats or cushions will consist of several "generations" of shoots (or plants). *G. ankaratrense*, therefore, very clearly exhibits *geocarpy*, a most uncommon (or unique?) situation in the genus.

DISCUSSION

The chromosome base number of x = 9 is very unusual in *Galium* (the dominant base number in the genus — and in the majority of the *Rubiaceae* — is x = 11). The base number of x = 9 in African *Galium* species is only documented for *G. hochstetteri* and for *G. ruwenzoriense* (HEDBERG & HEDBERG, 1977), but *exact* counts even for these taxa are not known ("2n = ca. 36" and "2n = ca. 36, ca. 38, 38-42" respectively). Nevertheless, the apparently derived base number of x = 9 could support the presumed relationships between *G. ankaratrense* and the afroalpine *G. hochstetteri* (cf. PUFF & MANTELL, 1982), although the unusual geocarpy in *G. ankaratrense* (definitely absent in *G. hochstetteri*, field obs. C. P.!) seems to exclude the likelihood of a very close alliance.

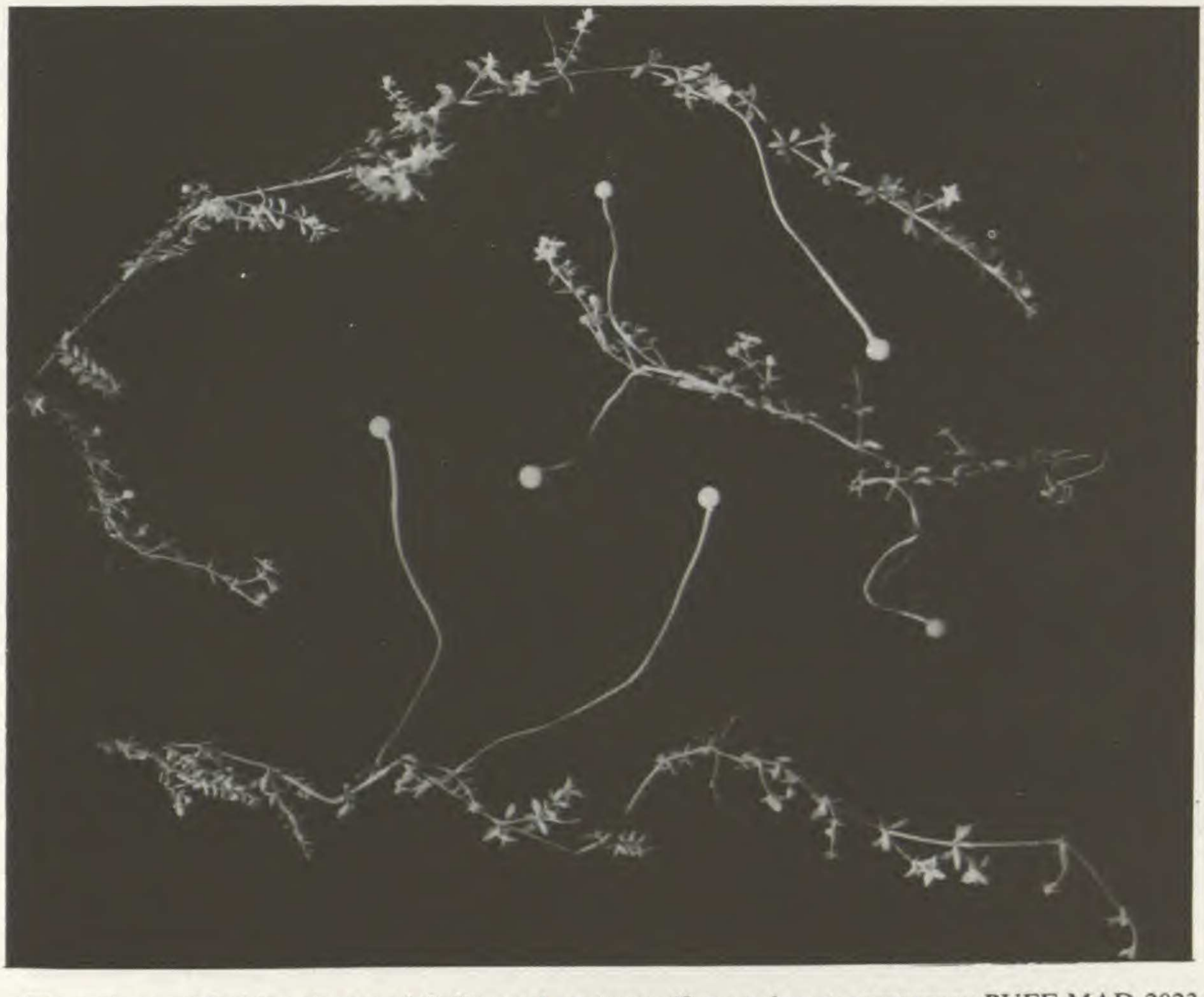

Fig. 2. — Flowering and fruiting shoots of **Galium ankaratrense** (from colour transparency PUFF MAD-2023 = *Puff et al. 850826-2/1*) × 1.

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